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(54) Title: SYSTEM AND METHODS FOR LOCATION BASED CALL ROUTING IN A CELLULAR NETWORK

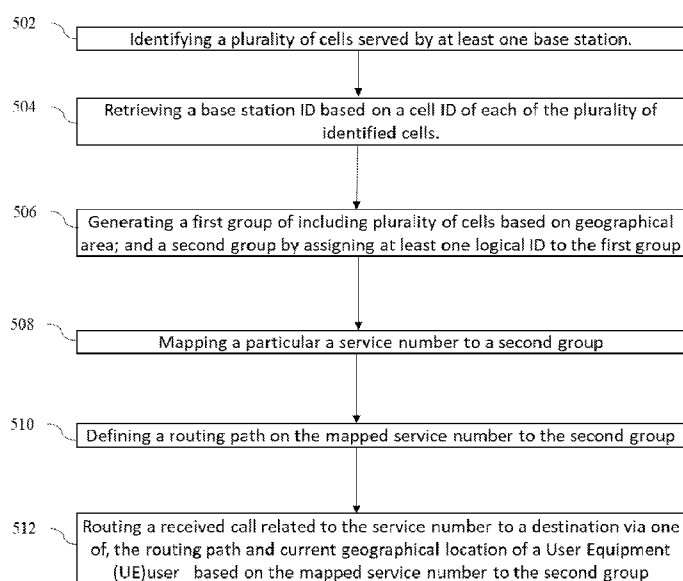


FIG. 5

(57) Abstract: The present disclosure relates to a system (108) and a method (500) for location based call routing in a cellular network. The system (108) includes a call retrieving module (208) to identify a plurality of cells served by at least one base station (110) and to retrieve a base station ID and a cell ID of each of the plurality of identified cells. The system (108) further includes a group generation module (210) to generate grouping of cells to logical ID for a particular geographical area. The system (108) further includes a mapping module (212) to map a particular service number to a single logical ID. The system (108) further includes a routing module (214) to define a routing path and current geographical location of a user equipment (UE) (102) based on the mapped service number to the second group.

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SYSTEM AND METHODS FOR LOCATION BASED CALL ROUTING IN A CELLULAR NETWORK

FIELD OF THE INVENTION

[0001] The present invention relates to cellular networks and more particularly to a method and system for location based call routing in the cellular networks.

BACKGROUND OF THE INVENTION

[0002] A cellular network or mobile network is a telecommunications network where the link is wireless and the network is distributed over land areas called cells, each served by at least one fixed-location transceiver. These base stations provide the cell with the network coverage which can be used for transmission of voice, data, and other types of content.

[0003] When joined together, these cells provide radio coverage over a wide geographic area. This enables numerous portable transceivers (e.g., mobile phones, tablets and laptops equipped with mobile broadband modems, pagers, etc.) to communicate with each other and with fixed transceivers and telephones anywhere in the network, via base stations.

[0004] A cell site, cell phone tower, or cellular base station is a cellular-enabled mobile device site where antennas and electronic communications equipment are placed (typically on a radio mast, tower, or other raised structure) to create a cell, or adjacent cells, in a cellular network. The structure typically supports antenna and one or more sets of transmitter/receivers, digital signal processors, control electronics, a GPS receiver for timing, primary and backup electrical power sources, and sheltering.

[0005] The cellular network has a network of handheld mobile phones (cell phones) in which each phone communicates with the telephone network through a local antenna at a cellular base station (cell site). The coverage area in which service is

provided is divided into a mosaic of small geographical areas called "cells", each served by a separate low power multichannel transceiver and antenna at a base station. The cellular devices such as the cell phones within a cell communicate with the system through that cell's antenna.

[0006] When a mobile user moves from one cell to another, their phone is automatically "handed off" to the new cell's antenna, and assigned a new set of frequencies, and subsequently communicates with this antenna. This background handoff process is imperceptible to the user and can occur in the middle of a phone call without any service interruption. Each cell phone has an automated full duplex digital transceiver and communicates with the cell antenna over two digital radio channels in the UHF or microwave band, one for each direction of the bidirectional conversation, plus a control channel which handles registering the phone with the network, dialling, and the handoff process.

[0007] A cellular network mobile phone system gets its name from dividing the service area into many small cells. Typically, a cell tower is located at the edge of one or more cells and covers multiple cells using directional antennas. A common geometry is to locate the cell site at the intersection of three adjacent cells, with three antennas at 120° angles each covering one cell. In another example, the cell tower may be covering and serving eight cells, i.e., eight geographically divided regions.

[0008] With the increasing penetration of cell phone usage, the use of location base services is also increasing. Due to use of higher frequency range, the range of a particular eNodeB/gNodeB has reduced and hence the total number of eNodeB/gNodeB has increased significantly. As a result, it becomes difficult and cumbersome to manage routing data for individual cell. Besides, with the increasing number of service numbers, cells and the, there is undesirable latency and delay in serving such requests as the database to be searched is huge and keeps on increasing as new cell or service numbers are added to the network on an ongoing basis.

[0009] Further, maintenance of such a huge database with ever increasing service request numbers or cell is also cumbersome and prone to errors and bugs.

[00010] There is a need for a system and method to manage such huge database of cellular service number and reduce latency and delay in serving such requests from the cellular devices.

BRIEF SUMMARY OF THE INVENTION

[00011] One or more embodiments of the present disclosure provide a system and a method for location based call routing in a cellular network.

[00012] In one aspect of the present invention, a system for location based call routing in a cellular network is disclosed. The system includes a retrieving module. The retrieving module configured to identify a plurality of cells served by at least one base station and to retrieve a base station ID based on a cell ID of each of the plurality of identified cells. In an embodiment, the base station is at least one of an evolved Node B (eNodeB). The system includes a group generation module. The group generation module is configured to generate a first group including the plurality of cells based on a geographical area and generate a second group by assigning at least one Logical Identifier (logical ID) to the first group. In one embodiment, the logical ID is associated with at least one geographical area. The system includes a mapping module. The mapping module configured to map a particular service number to the second group. The system includes a routing module. The routing module configured to define a routing path based on the mapped service number to the second group and route a received call related to the service number to a destination via one of the routing paths and current geographical location of a user equipment (UE) based on the mapped service number to the second group.

[00013] In an embodiment, the routing path is defined based on the mapped service number to the second group, the second group includes at least one logical ID assigned to the first group which includes the plurality of cells.

[00014] In another embodiment, subsequent to the identification of the plurality of cells served by the at least one base station, the entry of the base station ID is stored

in a database, thereby reducing number of entries at the database pertaining to the plurality of cells served by the at least one base station by a factor.

[00015] In yet another embodiment, the grouping of plurality of cells and routing are customizable depending upon requirement of network operators.

[00016] In another aspect of the present invention, the method for location based call routing in a cellular network is disclosed. The method includes the step of identifying by one or more processors, a plurality of cells served by at least one base station. The method includes the step of retrieving, by one or more processors, a base station ID based on a cell ID of each of the plurality of identified cells. The method includes the step of generating by one or more processors, a first group including the plurality of cells based on a geographical area. The method further includes the step of generating by one or more processors, a second group by assigning at least one logical ID to the first group. The method includes a step of mapping by one or more processors, a particular service number to the second group. The method further includes the step of defining, by one or more processors, a routing path based on the mapped service number to the second group. Thereafter, the method includes step of routing, by the one or more processors, a received call related to the service number to a destination via one of, the routing path and current geographical location of a user equipment (UE) user based on the mapped service number to the second group is resolved.

[00017] In another aspect of the present invention, the User Equipment (UE) includes one or more primary processors and a memory. The one or more primary processors is communicatively coupled to one or more processors and the memory. The memory stores instructions which when executed by the one or more primary processors cause the UE to transmit a call related to a service number from a user to the one or more processors in order to avail one or more services.

[00018] Other features and aspects of this invention will be apparent from the following description and the accompanying drawings. The features and advantages described in this summary and in the following detailed description are not all-inclusive, and particularly, many additional features and advantages will be apparent to one of ordinary skill in the relevant art, in view of the drawings, specification, and

claims hereof. Moreover, it should be noted that the language used in the specification has been principally selected for readability and instructional purposes and may not have been selected to delineate or circumscribe the inventive subject matter, resort to the claims being necessary to determine such inventive subject matter.

BRIEF DESCRIPTION OF THE DRAWINGS

[00019] The accompanying drawings, which are incorporated herein, and constitute a part of this disclosure, illustrate exemplary embodiments of the disclosed methods and systems in which like reference numerals refer to the same parts throughout the different drawings. Components in the drawings are not necessarily to scale, emphasis instead being placed upon clearly illustrating the principles of the present disclosure. Some drawings may indicate the components using block diagrams and may not represent the internal circuitry of each component. It will be appreciated by those skilled in the art that disclosure of such drawings includes disclosure of electrical components, electronic components or circuitry commonly used to implement such components.

[00020] **FIG. 1** is an exemplary block diagram of an environment for location based call routing in a cellular network, according to various embodiments of the present invention;

[00021] **FIG. 2** is an exemplary block diagram of a system for location based call routing in the cellular network, according to various embodiments of the present invention;

[00022] **FIG. 3** is a schematic representation of a workflow of the system of **FIG. 2**, according to various embodiments of the present invention;

[00023] **FIG. 4** is an exemplary embodiment of a routing module of the system of **FIG. 2**, according to various embodiments of the present invention; and

[00024] **FIG. 5** shows a flow diagram of a method for location based call routing in the cellular network, according to various embodiments of the present invention

[00025] The foregoing shall be more apparent from the following detailed description of the invention.

DETAILED DESCRIPTION OF THE INVENTION

[00026] Some embodiments of the present disclosure, illustrating all its features, will now be discussed in detail. It must also be noted that as used herein and in the appended claims, the singular forms "a", "an" and "the" include plural references unless the context clearly dictates otherwise.

[00027] Various modifications to the embodiment will be readily apparent to those skilled in the art and the generic principles herein may be applied to other embodiments. However, one of ordinary skill in the art will readily recognize that the present disclosure including the definitions listed here below are not intended to be limited to the embodiments illustrated but is to be accorded the widest scope consistent with the principles and features described herein.

[00028] A person of ordinary skill in the art will readily ascertain that the illustrated steps detailed in the figures and here below are set out to explain the exemplary embodiments shown, and it should be anticipated that ongoing technological development will change the manner in which particular functions are performed. These examples are presented herein for purposes of illustration, and not limitation. Further, the boundaries of the functional building blocks have been arbitrarily defined herein for the convenience of the description. Alternative boundaries can be defined so long as the specified functions and relationships thereof are appropriately performed. Alternatives (including equivalents, extensions, variations, deviations, etc., of those described herein) will be apparent to persons skilled in the relevant art(s) based on the teachings contained herein. Such alternatives fall within the scope and spirit of the disclosed embodiments.

[00029] Referring to **FIG. 1**, **FIG. 1** illustrates an exemplary block diagram of an environment **100** for a location based call routing in a cellular network **106**, according to various embodiments of the present invention. The environment **100** includes at least one User Equipment (UE) **102** configured to at least transmit a service request from the at least one UE **102** to a service number to avail one or more services, such as, but not limited to, voice and data from the UE **102**. The service numbers are configured to receive the service request based on at least a geographical location of

the at least one UE **102**. In another embodiment, the one or more services may not be limited to calling and may include messaging, delivering of multimedia. More information regarding the same will be provided with reference to the following figures.

[00030] The UE **102** may include, but are not limited to, a handheld wireless communication device (e.g., a mobile phone, a smart phone, a tablet device, and so on), a wearable computer device (e.g., a head-mounted display computer device, a head-mounted camera device, a wristwatch computer device, and so on), a Global Positioning System (GPS) device, a laptop computer, a tablet computer, or another type of portable computer, a media playing device, a portable gaming system, and/or any other type of computer device with wireless communication capabilities, and the like.

[00031] Further, as per the illustrated embodiment, the at least one UE **102** is one of a first UE **102a**, a second UE **102b**, and a third UE **102c**. It is to be however noted that the at least one UE **102** is described with respect to the first UE **102a**, the second UE **102b**, and the third UE **102c** for the purpose of description and illustration and should nowhere be construed as limiting the scope of the present disclosure. As such, each of the first UE **102a**, the second UE **102b**, and the third UE **102c** is configured to connect to the service number hosted on a remote server **104** via the cellular network **106**.

[00032] The remote server **104** may include by way of example but not limitation, one or more of a standalone server, a server blade, a server rack, a bank of servers, a server farm, hardware supporting a part of a cloud service or system, a home server, hardware running a virtualized server, one or more processors executing code to function as a server, one or more machines performing server-side functionality as described herein, at least a portion of any of the above, some combination thereof. In an embodiment, the entity may include, but is not limited to, a vendor, a network operator, a company, an organization, a university, a lab facility, a business enterprise, a defence facility, or any other facility that provides content.

[00033] The cellular network **106** may include, by way of example but not limitation, at least a portion of one or more networks having one or more nodes that transmit,

receive, forward, generate, buffer, store, route, switch, process, or a combination thereof, etc. one or more messages, packets, signals, waves, voltage or current levels, some combination thereof, or so forth. The cellular network **106** may also include, by way of example but not limitation, one or more of a wireless network, a wired network, an internet, an intranet, a public network, a private network, a packet-switched network, a circuit-switched network, an ad hoc network, an infrastructure network, a Public-Switched Telephone Network (PSTN), a cable network, a cellular network, a satellite network, a fiber optic network, or some combination thereof.

[00034] Further, in one embodiment, the cellular network **106** may include, but not limited to, a Third Generation (3G), a Fourth Generation (4G), a Fifth Generation (5G), a Sixth Generation (6G), a New Radio (NR), a Narrow Band Internet of Things (NB-IoT), an Open Radio Access Network (O-RAN), and the like.

[00035] In one embodiment, each of the first UE **102a**, the second UE **102b**, and the third UE **102c** is communicably coupled to a base station **110** via the remote server **104**. The base station **110** is configured to provide each of the first UE **102a**, the second UE **102b**, and the third UE **102c** with a network coverage and thereby aiding each of the first UE **102a**, the second UE **102b**, and the third UE **102c** in transmitting the service request to avail the one or more services such as, but not limited to, voice and data. As per the illustrated embodiment, the environment **100** includes the one base station **110**. However, in alternate embodiments, the environment **100** may include one or more base stations **110**.

[00036] For the purpose of description and explanation, the description will be explained with respect to one or more base stations **110**, or to be more specific will be explained with respect to a first base station **110a**, a second base station **110b**, and a third base station **110c**, and should nowhere be construed as limiting the scope of the present disclosure.

[00037] Each of the first base station **110a**, the second base station **110b**, and the third base station **110c** includes by way of example but not limitation, a cell site, cell phone tower, or cellular base station is a cellular-enabled mobile device site where antennas and electronic communications equipment are placed (typically on a radio mast, tower,

or other raised structure) to create a cell, or adjacent cells, in the cellular network **106**. The structure typically supports an antenna and one or more sets of transmitters/receivers, digital signal processors, control electronics, a GPS receiver for timing, primary and backup electrical power sources, and sheltering.

[00038] Further the remote server **104**, may be communicably connected to a system **108**, via the cellular network **106**. The system **108**, may be configured to access the service request from each of the at least first UE **102a**, the second UE **102b**, and the third UE **102c** and the network coverage which can be used for transmission of voice, data, and other types of content.

[00039] The environment **100** further includes the system **108** for location based call routing, communicably coupled to each of the first base station **110a**, the second base station **110b**, and the third base station **110c** and each of the at least first UE **102a**, the second UE **102b**, and the third UE **102c** via the cellular network **106**. The system **108** is configured to manage the call routing data in the cellular network **106**. The system **108** is adapted to be embedded within the remote server **104** or is embedded as the individual entity. However, for the purpose of description, the system **108** is described as an integral part of the remote server **104**, without deviating from the scope of the present disclosure.

[00040] Operational and construction features of the system **108** will be explained in detail with respect to the following figures.

[00041] Referring to **FIG. 2**, **FIG. 2** illustrates a block diagram of the system **108** for location based call routing in the cellular network **106**, according to one or more embodiments of the present invention. As per the illustrated embodiment, the system **108** includes one or more processors **202**, a memory **204**, and an input/output interface unit **206**. The one or more processors **202**, hereinafter referred to as the processor **202** may be implemented as one or more microprocessors, microcomputers, microcontrollers, digital signal processors, central processing units, state machines, logic circuitries, single board computers, and/or any devices that manipulate signals based on operational instructions. As per the illustrated embodiment, the system **108** includes one processor **202**. However, it is to be noted that the system **108** may include

multiple processors as per the requirement and without deviating from the scope of the present disclosure. Among other capabilities, the processor **202** is configured to fetch and execute computer-readable instructions stored in the memory **204**.

[00042] The memory **204** may be configured to store one or more computer-readable instructions or routines in a non-transitory computer-readable storage medium, which may be fetched and executed to create or share data packets over a network service. The memory **204** may include any non-transitory storage device including, for example, volatile memory such as RAM, or non-volatile memory such as EPROM, flash memory, and the like. In an embodiment, the input/output (I/O) interface unit **206** includes a variety of interfaces, for example, interfaces for data input and output devices, referred to as Input/Output (I/O) devices, storage devices, and the like. The I/O interface unit **206** facilitates communication of the system **108**. In one embodiment, the I/O interface unit **206** provides a communication pathway for one or more components of the system **108**.

[00043] Further, the processor **202**, in an embodiment, may be implemented as a combination of hardware and programming (for example, programmable instructions) to implement one or more functionalities of the processor **202**. In the examples described herein, such combinations of hardware and programming may be implemented in several different ways. For example, the programming for the processor **202** may be processor-executable instructions stored on a non-transitory machine-readable storage medium and the hardware for processor **202** may comprise a processing resource (for example, one or more processors), to execute such instructions. In the present examples, the memory **204** may store instructions that, when executed by the processing resource, implement the processor **202**. In such examples, the system **108** may comprise the memory **204** storing the instructions and the processing resource to execute the instructions, or the memory **204** may be separate but accessible to the system **108** and the processing resource. In other examples, the processor **202** may be implemented by electronic circuitry.

[00044] In order for the system **108** to manage the call routing request, the processor **202** includes a retrieving module **208**, a group generation module **210**, a mapping module **212** and a routing module **214** communicably coupled to each other.

[00045] The retrieving module **208** of the processor **202** is communicably connected to each of the at least first UE **102a**, the second UE **102b**, and the third UE **102c** via the cellular network **106**. Accordingly, the retrieving module **208** is configured to identify each of the at least first UE **102a**, the second UE **102b**, and the third UE **102c** served by at least each of the first base station **110a**, the second base station **110b**, and the third base station **110c** and retrieve a Base Station Identifier (BSID) based on a cell identifier (cell ID) of each of the plurality of identified cells. The Base Station Identifier (BSID) is a unique identifier assigned to a wireless base station or a cell tower that is used to identify and differentiate between the each of the first base station **110a**, the second base station **110b**, and the third base station **110c** in the cellular network **106**. In one embodiment, the cell ID refers to the unique identifier assigned to a specific cell in the plurality of identified cells within the cellular network **106**.

[00046] As per above embodiment, each of the first base station **110a**, the second base station **110b**, and the third base station **110c** is responsible for providing wireless communication coverage to a specific geographical area known as the plurality of cells. Each cell in the plurality of cells is typically served by each of the first base station **110a**, the second base station **110b**, and the third base station **110c**, and the BSID is used to uniquely identify each of the first base station **110a**, the second base station **110b**, and the third base station **110c** within the cellular network **106**. The BSID enables the each of the at least first UE **102a**, the second UE **102b**, and the third UE **102c** to connect and communicate with the appropriate base station **110** as they move throughout the coverage area.

[00047] The BSIDs are used to identify individual base stations, optimize network performance, and enable location based services. The specific format and function of the BSID may vary depending on a wireless communication protocol used in the cellular network. For example, In GSM networks, the BSID is known as the Cell Identity (CID) and is a 16-bit number that is unique within the Location Area Code

(LAC). In Universal Mobile Telecommunications System (UMTS) networks, the BSID is known as the NodeB Identity (NID) and is a 28-bit number that is unique within the Radio Network Controller (RNC). In Long term-evolution (LTE) networks, the BSID is known as the Physical Cell Identity (PCI) and is a 16-bit number that is unique within the cell. The BSID is stored in the UE's memory (as shown in **FIG. 3**). When each of the at least first UE **102a**, the second UE **102b**, and the third UE **102c** first connects to the cellular network **106**, the BSID is used to identify and connect to the each of the first base station **110a**, the second base station **110b**, and the third base station **110c**.

[00048] Further, the base station ID based on the cell ID of each of the plurality of identified cells are stored in the database **216**, thereby reducing number of entries at the database **216** pertaining to the plurality of cells served by the at least one base station **110** by a factor.

[00049] The group generation module **210** of processor **202** is communicably connected to the retrieving module **208**. The group generation module **210** retrieves the base station ID of each of the at least first UE **102a**, the second UE **102b**, and the third UE **102c** from the retrieving module **208**. In an embodiment, the group generation module **208** is configured to perform grouping of each of the first, the second, the third UE (**102a**, **102b**, **102c**) logically based upon location of at least first UE **102a**, the second UE **102b**, and the third UE **102c**. More specifically, the group generation module **210** is configured to generate a first group including the plurality of cells based on at least the geographical area. In an embodiment, the plurality of cells includes cell1 referred to a group of at least first UE **102a**, the second UE **102b**, and the third UE **102c** based upon a first geographical area, similarly, cell2 is referred to group of at least first UE **102a**, the second UE **102b**, and the third UE **102c** based on a second geographical area and so on. The group generation module **208** is configured to generate a second group by assigning at least one logical ID to the first group. The configuration and location of least first UE **102a**, the second UE **102b**, and the third UE **102c** depends upon the existing status of the infrastructure of the service provider/operator. In one embodiment, the grouping of plurality of cells and routing

are customizable depending upon the requirement of the network operators. The requirement of the network operators is based on at least one of, but not limited to, cell grouping and clustering, dynamic routing policies, Quality of Service (QoS) routing, service differentiation, and policy-based routing.

[00050] The mapping module **112** of the processor **202** is communicably connected to the group generation module **210**. The mapping module **212** collects the first group and the second group from the group generation module **210**. Further, the mapping module **212** is configured to map a particular service number to the second group. The second group includes at least one logical ID assigned to the first group. The particular service number refers to a special calling number such as “139”, “191”, “1047” used for accessing specific services or functionalities. The particular service numbers are typically assigned by the network operators and are often associated with particular services such as, but not limited to, customer support, directory assistance, emergency services, or value-added services like weather updates, and news alerts.

[00051] The routing module **214** of the processor **202** is communicably connected to the mapping module **212**. The routing module **214** collects the mapped service number to the second group from the mapping module **212**. Further, the routing module **214** is configured to define a routing path based on the mapped service number to the second group and route a received call related to the service number to a destination via one of the routing paths and current geographical location of least first UE **102a**, the second UE **102b**, and the third UE **102c** based on the mapped service number to the second group.

[00052] Referring to **FIG. 3**, **FIG. 3** describes a system **108** for managing the location based call routing in the cellular network **106**. It is to be noted that the embodiment with respect to **FIG. 3** will be explained with respect to the first UE **102a** and the system **108** for the purpose of description and illustration and should nowhere be construed as limited to the scope of the present disclosure. As mentioned earlier in **FIG. 1**, the first UE **102a** configured to at least transmit the service request from the at least one UE to the service number to avail one or more services, such as, but not limited to, voice and data from the first UE **102a**. The service numbers are configured

to receive the service request based on at least a geographical location of the at least one UE **102**. The first UE **102a** includes one or more primary processors **305** coupled with a memory **310** storing instructions which are executed by the one or more primary processors **305**. Execution of the stored instructions by the one or more primary processors **305** enables the first UE **102a** to transmit a service request from the at least first UE **102a**, the second UE **102b**, and the third UE **102c**.

[00053] The each of at least first UE **102a**, the second UE **102b**, and the third UE **102c** may comprise a memory such as a volatile memory (e.g., RAM), a non-volatile memory (e.g., disk memory, FLASH memory, EPROMs, etc.), an unalterable memory, and/or other types of memory. In one implementation, the memory might be configured or designed to store data. The data may pertain to attributes and access rights specifically defined for at least first UE **102a**, the second UE **102b**, and the third UE **102c**. The each of at least first UE **102a**, the second UE **102b**, and the third UE **102c** may be accessed by the user, to initiate call request to the base station **110**. The each of at least first UE **102a**, the second UE **102b**, and the third UE **102c** may be configured to connect with at least each of the first base station **110a**, the second base station **110b**, and the third base station **110c** through the cellular network **106**.

[00054] As mentioned earlier in **FIG. 2**, the processor **202** of the system **108** includes the retrieving module **208**, the group generation module **210**, the mapping module **212** and the routing module **214** communicably coupled to each other. The retrieving module **208** is configured to identify a plurality of cells served by at least one base station **110** and to retrieve the base station ID from the Base Station Identifier (BSID) based on the cell ID of each of the plurality of identified cells. Further, the grouping generation module **210** generates a first group including the plurality of cells based on a geographical area and a second group by assigning at least one logical ID to the first group. The mapping module **212** maps a particular service number to the second group. The routing module **214** defines a routing path based on the mapped service number to the second group and route, a received call related to the service number to a destination via one of, the routing path and current geographical location of the each of at least first UE **102a**, the second UE **102b**, and the third UE **102c** based on the

mapped service number to the second group. Further, the processor **202** of the system **108** is coupled with the primary processor **305** of the first UE **102a**.

[00055] For the sake of brevity, it is to be noted that similar description related to the working and operation of the system **108** as illustrated in **FIG. 2** has been omitted to avoid repetition. The limited description provided for the system **108** in **FIG. 3**, should be read with the description as provided for the system **108** in the **FIG. 2** above, and should not be construed as limiting the scope of the present disclosure.

[00056] Referring to **FIG. 4**, **FIG. 4** is an exemplary embodiment of a routing module of the system **108** of **FIG. 2**, according to various embodiments of the present invention.

[00057] As mentioned earlier in **FIG. 2**, the processor **202** of the system **108** includes the retrieving module **208**, the group generation module **210**, the mapping module **212** and the routing module **214** communicably coupled to each other. The group generation module **210** includes grouping and mapping of the plurality of cells (cell1 **401**, cell2 **402**, cell3 **403**) to a predetermined Logical Id (L-ID1, L-ID2, L-ID3, etc.). In an embodiment, the grouping is fixed and is not changed in real time, irrespective of the change or addition of new service number. Once the plurality of cells is grouped with the logical ID (L-ID1), the association of the plurality of cells and the associated logical ID (L-ID1) will be maintained in the database **216**, irrespective of whether the service number is added, removed or modified.

[00058] For example, Table 1 is shown below illustrating the grouping of the plurality of cells such as cell1 **401**, cell2 **402** and cell3 **403**, which may be grouped into a single group and assigned to the single logical ID L-ID1 which in turn may be associated with the special calling number such as “139”, “191”, “1047” and the like., the special calling numbers are dedicated calling numbers which are frequently used by the each of at least first UE **102a**, the second UE **102b**, and the third UE **102c** for general or dedicated to specific services as per the operator, service provider of regulatory authorities. The L-ID1 may be associated with “139”, the L-ID2 may be associated with “139”, and the L-ID3 may be associated with “1047.”

[00059] Table 1:

Cell	Logical Id	Assigned special calling number
Cell1	L-Id1	139
Cell2		
Cell3 up to cell8		
Cell9	L-Id2	191
Cell10		
Cell11 up to cell 16		

[00060] The special calling numbers such as “139”, “191”, “1047” may be referred to as level one service numbers and may vary with the service provider and operator.

[00061] Further, when at least cell1 **401** makes a call from geographical area one (Area 1) to the special calling number “139”, the call is routed via a single route R1 associated with L-Id1 (shown below Table 2). This increases the process efficiency and reduces the latency in servicing the requests.

[00062] Table 2 illustrates the mapping of various logical IDs (L-ID1, L-ID2, L-ID3, etc.) to specific associated routes (R1, R2, R3, etc.) and corresponding special calling numbers.

[00063] Table 2:

Special calling no.	Logical Id	Route	Geographical Location
139	L-Id1	R1	Area1
191	L-Id2	R2	Area2
1047	L-Id3	R3	Area3

[00064] Further, grouping together of the plurality of cells for servicing the requests reduces the effort required in maintaining the database **216** and improves in the servicing of the request faster, efficient and reduces the latency.

[00065] In an embodiment, the method and system of the invention can be configured to map a particular cellular network **106** area to a specific logical Id as per the requirement of the user or operator. The routing call service is effectively based upon the location of the plurality of cells and the special calling number being called by the at least one UE **102** is at least one of a first UE **102a**, a second UE **102b**, and a third UE **102c**.

[00066] Referring to **FIG. 5**, **FIG.5** shows a flow diagram of a method **500** for location based call routing in the cellular network **106**, according to various embodiments of the present invention. For the purpose of description, the method **500** is described with the embodiments as illustrated in **FIG. 2** and should nowhere be construed as limiting the scope of the present disclosure.

[00067] At step **502**, the method **500** includes the step of identifying of cells by each of the first base station **110a**, the second base station **110b**, and the third base station **110c** and retrieving the base station ID based on the cell ID by the one or more processors **202**. The retrieving module **208** is configured to identify plurality of cells and retrieve the cell ID of each identified cells. Further, the base station ID based on the cell ID of each of the plurality of identified cells are stored in the database **216**, thereby reducing number of entries at the database **216** pertaining to the plurality of cells served by at least each of the first base station **110a**, the second base station **110b**, and the third base station **110c** by a factor. At step **504**, the method **500** includes the step of generating first group of the plurality of the cells based on a geographical area and generating a second group by assigning at least one logical ID to the first group.

[00068] At step **506**, the method **500** includes the step of mapping a particular service number to the second group. The second group includes at least one logical ID to the first group. For example, the grouping of plurality of the cells such as cell1 **401**, cell2 **402** and cell3 **403**, which may be grouped into a single group and assigned to a single logical ID L-ID1 which in turn may be associated with a special calling number such

as “139”, “191”, “1047” and the like. The special calling numbers such as “139”, “191”, “1047” may be referred to as level one service numbers and may vary with the service provider and the operator.

[00069] At step **508**, the method **500** includes the steps of defining of final routing path based on the mapped service number to the second group.

[00070] At step **510**, the method **500** includes the step of routing the received call related to the service number to a destination via one of, the routing path and current geographical location of each of the at least first UE **102a**, the second UE **102b**, and the third UE **102c** user based on the mapped service number to the second group. For example, a group of the plurality of cells (for example, CD1) cell1 **401**, cell2 **402**, or cell3 **403**, is mapped to L-ID1, which in turn is associated with special calling number “139”. When at least the cell (cell1 **401**) in a group of the plurality of cells (for example, CD1) makes a call to the special calling number “139”, the call is routed via a single route R1 associated with L-ID1. The grouping of plurality of cells and routing are customizable depending upon requirement of network services and network operators.

[00071] The present invention further discloses a non-transitory computer-readable medium having stored thereon computer-readable instructions. The computer-readable instructions are executed by a processor **202**. The processor **202** is configured to identify a plurality of cells served by at least one base station. The processor **202** is further configured to retrieve, the base station ID based on the cell ID of each of the plurality of identified cells. The processor **202** is further configured to generate the first group including the plurality of cells based on a geographical area and a second group by assigning at least one logical ID to the first group. The processor **202** is further configured to map, a particular service number to the second group. The processor **202** further defines, a routing path based on the mapped service number to the second group; and route, a received call related to the service number to a destination via one of, the routing path and current geographical location of a User Equipment (UE) **102** user based on the mapped service number to the second group.

[00072] The present disclosure incorporates technical advancement by the grouping of the plurality of the cells into the single group and assign to the single logical ID L-ID1 and the single logical ID L-ID1 is associated with the special calling number such as “139”, “191”, “1047” helps in reducing the size of the database **216** and thereby increases efficiency while organizing data and lowering latency.

[00073] The present invention offers multiple advantages over the prior art and the above listed are a few examples to emphasize on some of the advantageous features. The listed advantages are to be read in a non-limiting manner.

[00074] A person of ordinary skill in the art will readily ascertain that the illustrated embodiments and steps in description and drawings (FIG.1-5) are set out to explain the exemplary embodiments shown, and it should be anticipated that ongoing technological development will change the manner in which particular functions are performed. These examples are presented herein for purposes of illustration, and not limitation. Further, the boundaries of the functional building blocks have been arbitrarily defined herein for the convenience of the description. Alternative boundaries can be defined so long as the specified functions and relationships thereof are appropriately performed. Alternatives (including equivalents, extensions, variations, deviations, etc., of those described herein) will be apparent to persons skilled in the relevant art(s) based on the teachings contained herein. Such alternatives fall within the scope and spirit of the disclosed embodiments.

REFERENCE NUMERALS

- [0001] Environment - 100;
- [0002] User Equipment - 102;
- [0003] Remote server - 104;
- [0004] Cellular Network - 106;
- [0005] System - 108;
- [0006] Base station- 110;
- [0007] One or more processor -202;
- [0008] Memory - 204;
- [0009] Interface- 206;
- [0010] Retrieving module - 208;
- [0011] Group Generating module - 210;
- [0012] Mapping module - 212;
- [0013] Routing module - 214;
- [0014] Database – 216;
- [0015] Primary processor -305;
- [0016] Memory Unit of User Equipment – 310;
- [0017] Plurality of Cells - 401- 416.

We Claim:

1. A method (500) for location-based call routing in a cellular network, the method (500) comprises the steps of:
 - identifying, (502) by one or more processors (202), a plurality of cells served by at least one base station;
 - retrieving, (504) by the one or more processors (202), a base station ID based on a cell ID of each of the plurality of identified cells;
 - generating, (506) by the one or more processors (202), a first group including the plurality of cells based on a geographical area;
 - generating, (506) by the one or more processors (202), a second group by assigning at least one logical ID to the first group;
 - mapping, (508) by the one or more processors (202), a particular service number to the second group;
 - defining, (510) by the one or more processors (202), a routing path based on the mapped service number to the second group; and
 - routing, (512) by the one or more processors (202), a received call related to the service number to a destination via one of, the routing path and current geographical location of a User Equipment (UE) (102) based on the mapped service number to the second group.
2. The method (500) as claimed in claim 1, wherein the base station (110) is one of, an eNodeB.
3. The method (500) as claimed in claim 1, wherein the logical ID is associated with at least one geographical area.
4. The method (500) as claimed in claim 1, wherein the routing path is defined based on the mapped service number to the second group, wherein the second group

includes at least one logical ID assigned to the first group which includes the plurality of cells (410-416).

5. The method (500) as claimed in claim 1, wherein subsequent to the identification of the plurality of cells (410-416) served by the at least one base station, the entry of the base station ID is stored in a database (216), thereby reducing number of entries at the database pertaining to the plurality of cells (410-416) served by the at least one base station (110) by a factor.
6. The method (500) as claimed in claim 1, wherein the grouping of plurality of cells and routing are customizable depending upon requirement of network operators.
7. A system (108) for location-based call routing in a cellular network, the system (108) comprising:
 - a retrieving module (208) configured to:
 - identify, a plurality of cells (401-416) served by at least one base station (110); and
 - retrieve, a base station ID based on a cell ID of each of the plurality of identified cells;
 - a group generation module (210) configured to:
 - generate, a first group including the plurality of cells (401-416) based on a geographical area; and
 - generate, a second group by assigning at least one logical ID to the first group;
 - a mapping module (212) configured to, map, a particular service number to the second group;
 - a routing module (214) configured to:
 - define, a routing path based on the mapped service number to the second group; and

route, a received call related to the service number to a destination via one of, the routing path and current geographical location of a User Equipment (UE) (102) based on the mapped service number to the second group.

8. The system (108) as claimed in claim 7, wherein the base station (110) is one of, an eNodeB.
9. The system (108) as claimed in claim 7, wherein the logical ID is associated with at least one geographical area.
10. The system (108) as claimed in claim 7, wherein the routing path is defined based on the mapped service number to the second group, wherein the second group includes at least one logical ID assigned to the first group which includes the plurality of cells (410-416).
11. The system (108) as claimed in claim 7, wherein subsequent to the identification of the plurality of cells (410-416) served by the at least one base station (110), the entry of the base station ID is stored in a database (216), thereby reducing number of entries at the database (216) pertaining to the plurality of cells served by the at least one base station (110) by a factor.
12. The system (108) as claimed in claim 7, wherein the grouping of plurality of cells (410-416) and routing are customizable depending upon requirement of network operators.
13. A User Equipment (UE) (102), comprising:
 - one or more primary processors (305) communicatively coupled to one or more processors (202), the one or more primary processors (305) coupled with a memory (310), wherein said memory (310) stores instructions which when executed by the one or more primary processors (305) causes the UE (102) to:

transmit, a call related to a service number from a user to the one or more processors (202) in order to avail one or more services; and

wherein the one or more processors (202) is configured to perform the steps as claimed in claim 1.

14. A non-transitory computer-readable medium having stored thereon computer-readable instructions that, when executed by a processor (202), causes the processor to:

identify, a plurality of cells (410-416) served by at least one base station (110);

retrieve, a base station ID based on a cell ID of each of the plurality of identified cells;

generate, a first group including the plurality of cells (410-416) based on a geographical area;

generate, a second group by assigning at least one logical ID to the first group;

map, a particular service number to the second group;

define, a routing path based on the mapped service number to the second group; and

route, a received call related to the service number to a destination via one of, the routing path and current geographical location of a User Equipment (UE) (102) based on the mapped service number to the second group.

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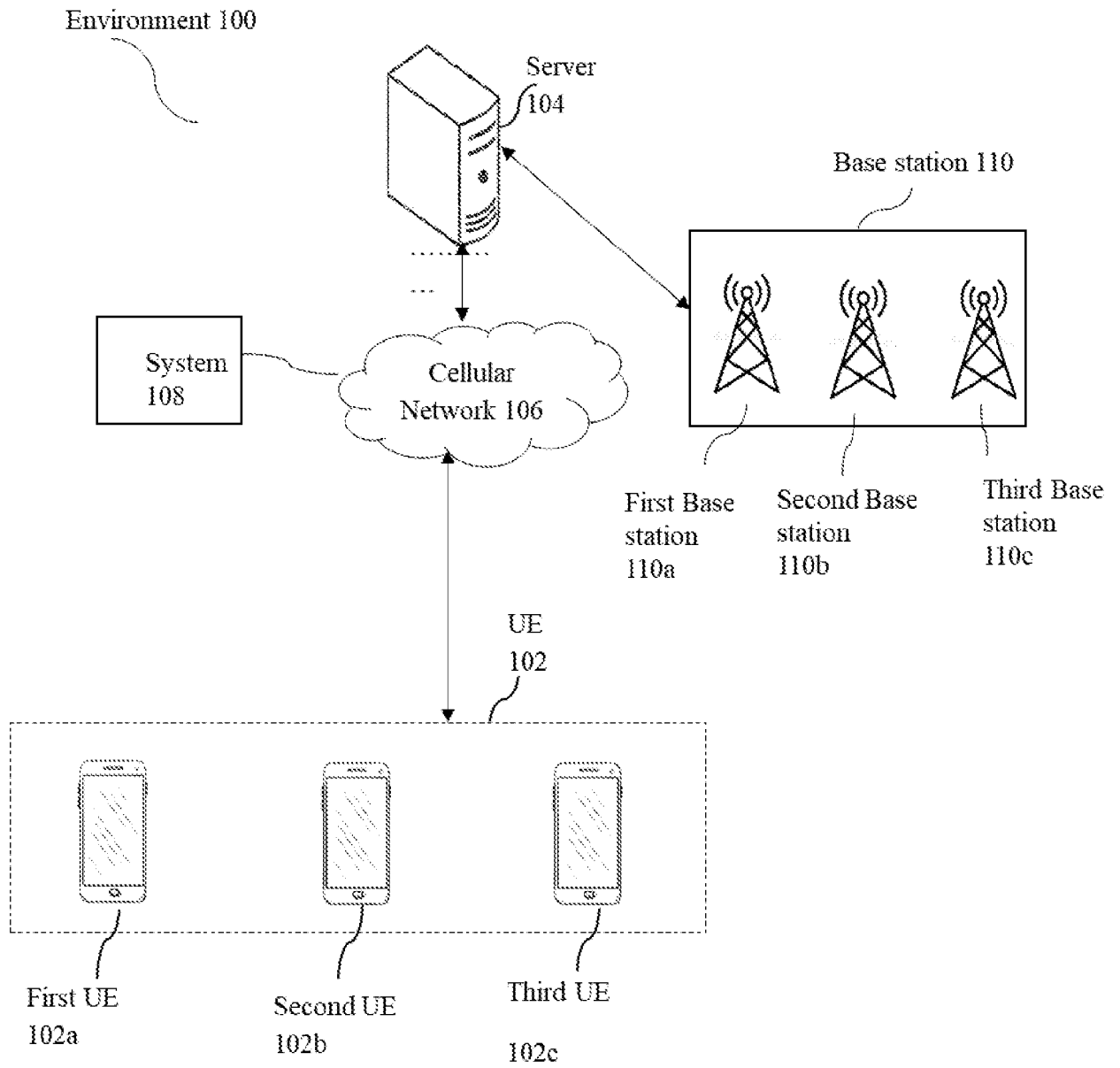


FIG. 1

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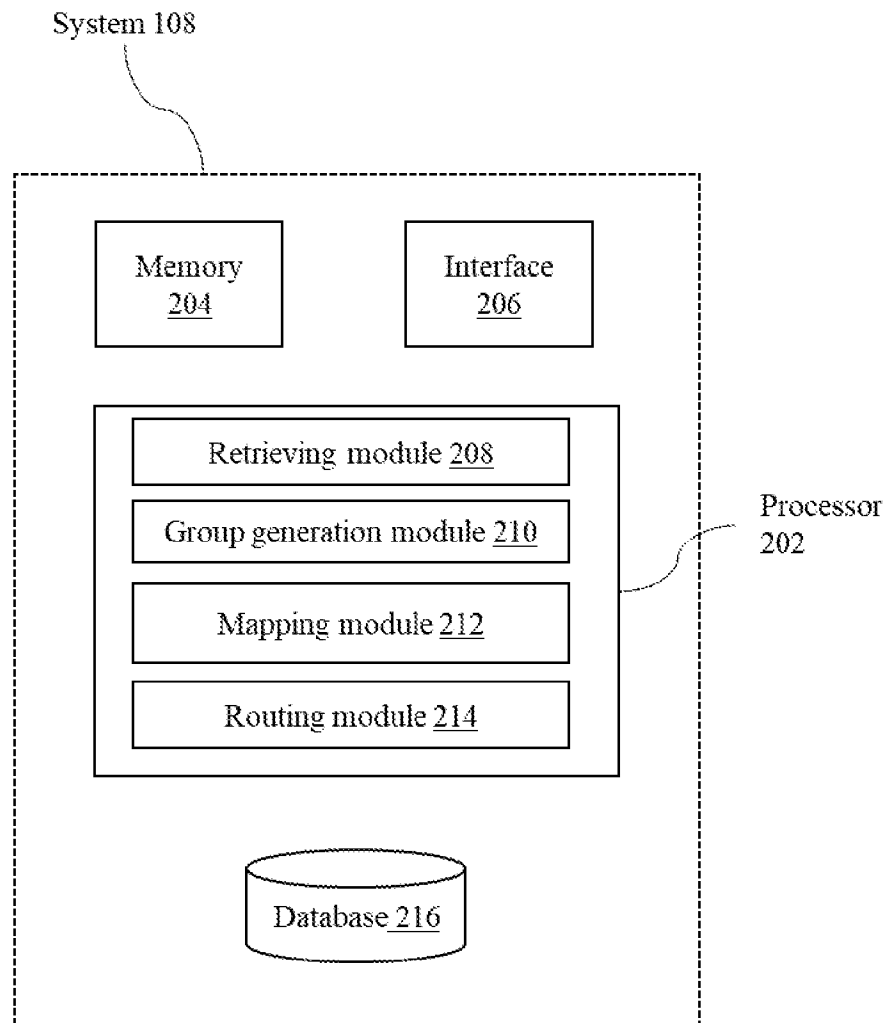


FIG. 2

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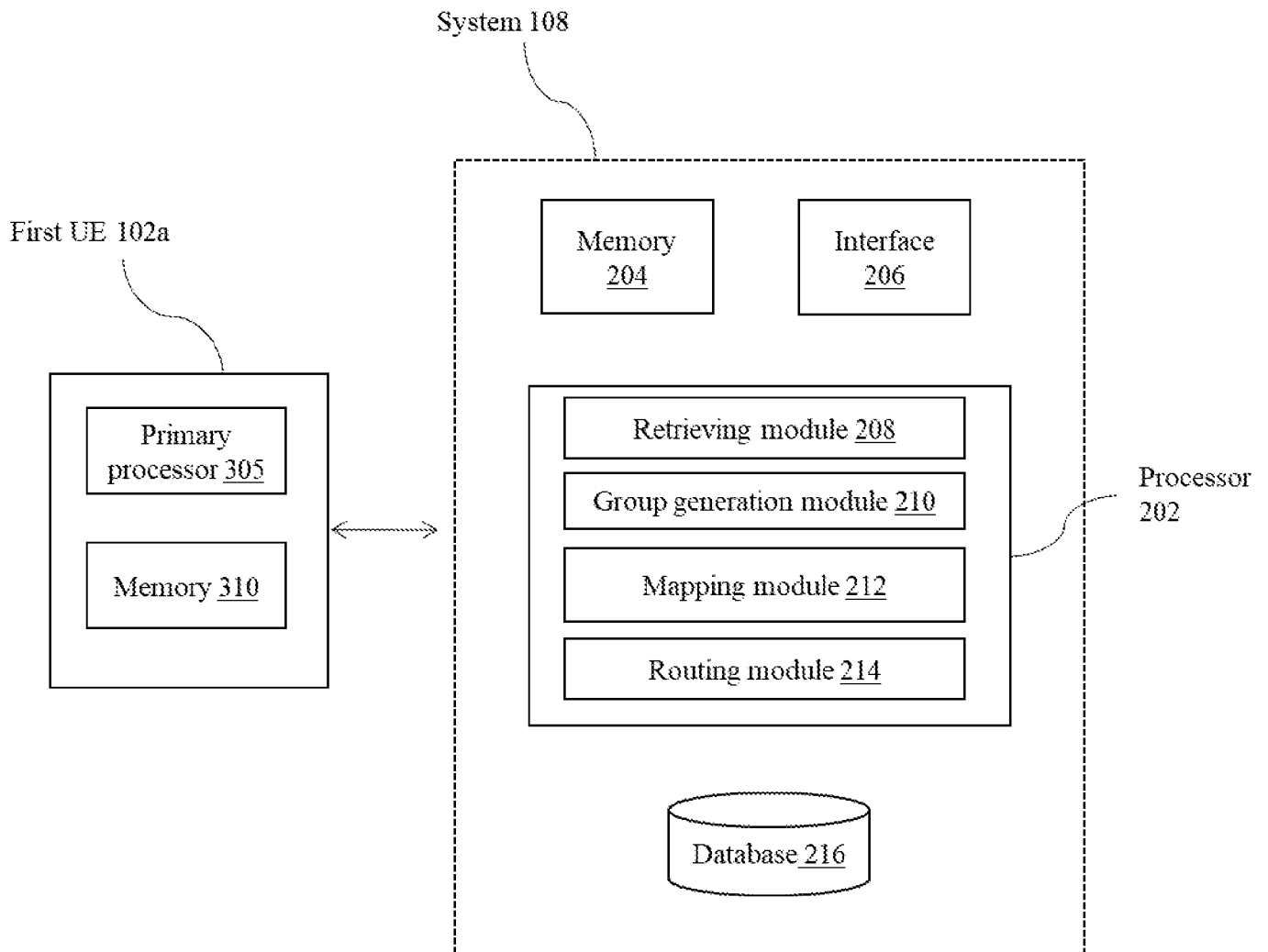


FIG. 3

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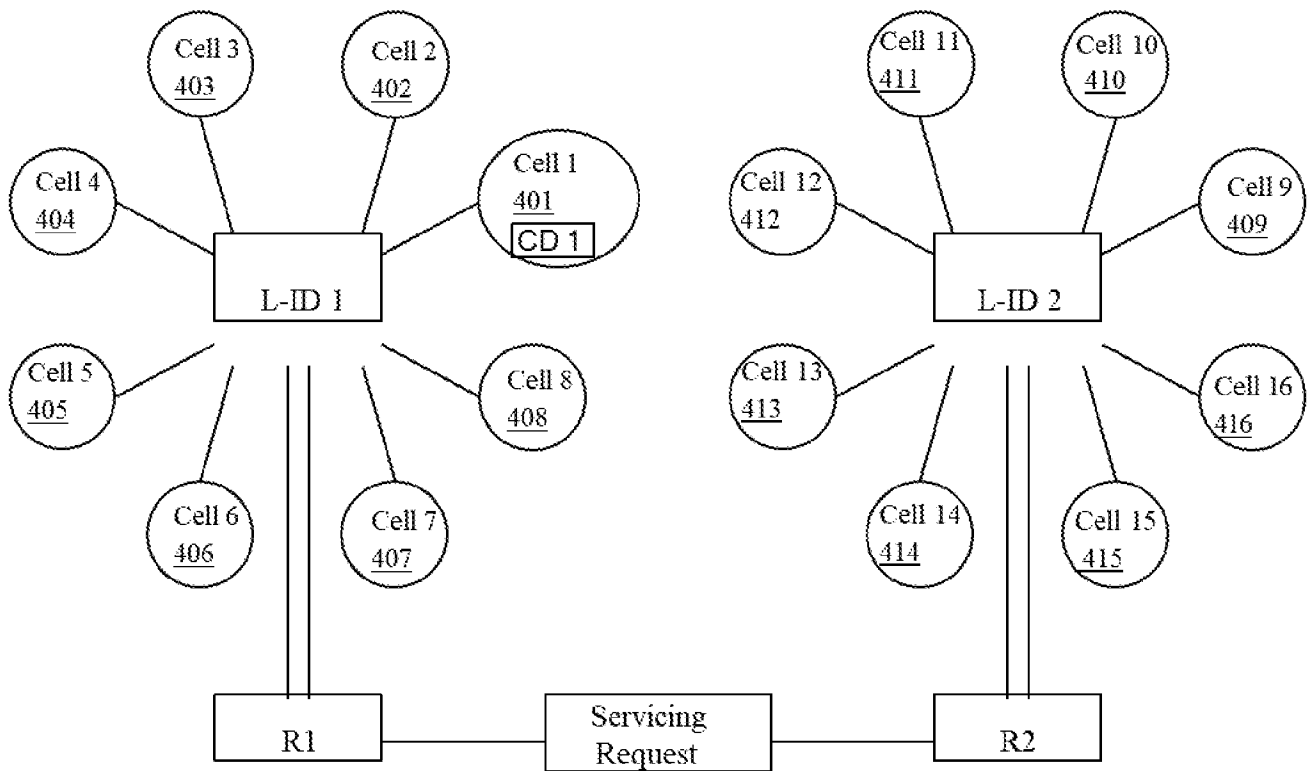


FIG. 4

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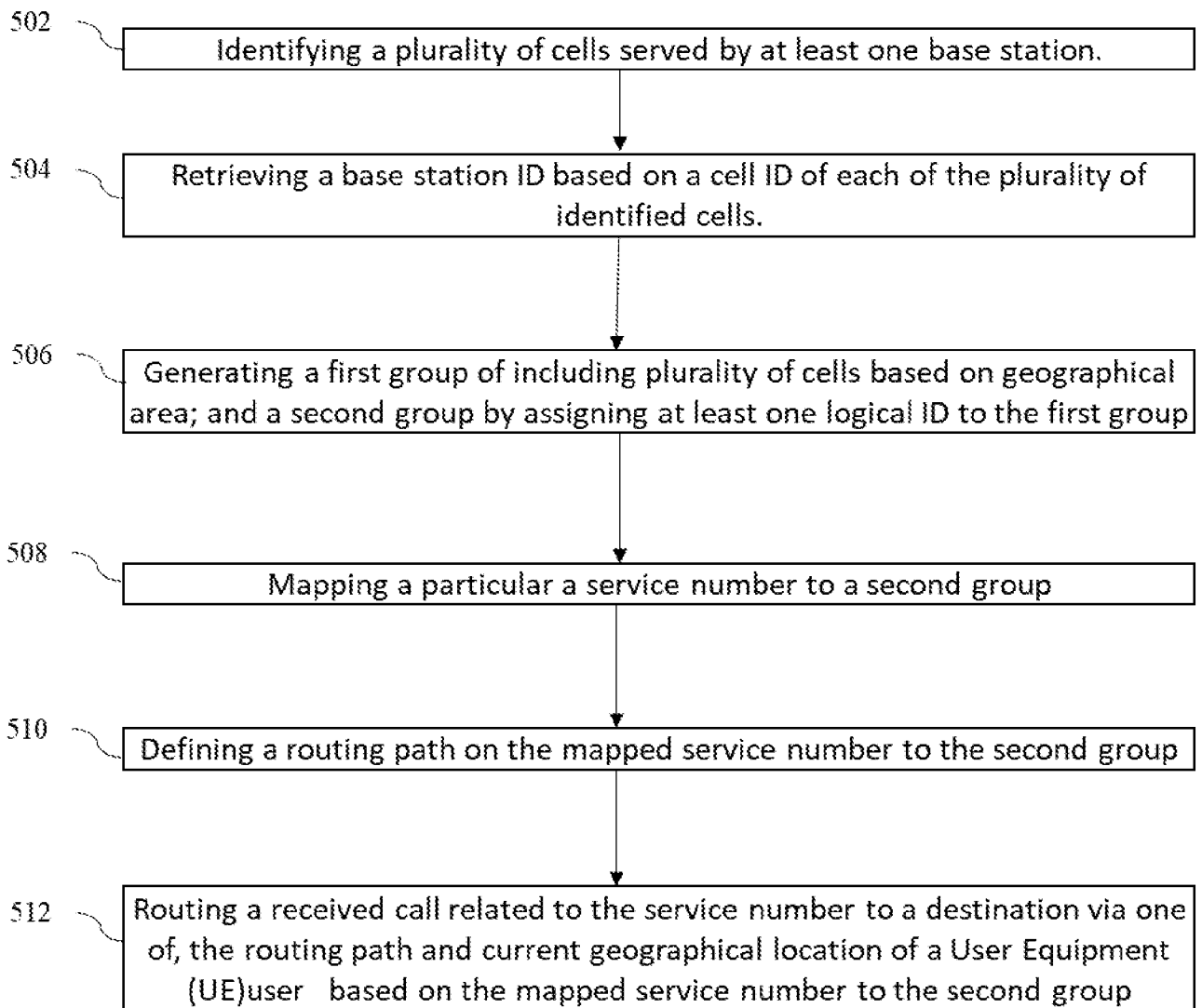


FIG. 5

INTERNATIONAL SEARCH REPORT

International application No.
PCT/IN2024/050923

A. CLASSIFICATION OF SUBJECT MATTER

H04W4/02, H04W64/00, H04L67/52 Version=2024.01

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

H04W, H04L

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic database consulted during the international search (name of database and, where practicable, search terms used)

PatSeer, IPO Internal Database

Keywords: Call, routing, location, service number, map, group, logical ID.

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	WO9846035A2 [QUALCOMM INC] 15 October 1998 (15-10-1998) Whole Document.	1-14
Y	WO2009011564A1 [TELEFON AB ET LM ERICSSON AB, NOLDUS ROGIER AUGUST CASPAR JOSEPH] 22 January 2009 (22-01-2009) Abstract; claims 1-26; figures 1-12.	1-14
A	US5946618A [QUALCOMM INC] 31 August 1999 (31-08-1999) Whole Document.	1-14



Further documents are listed in the continuation of Box C.



See patent family annex.

* Special categories of cited documents:

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"I" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

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"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&" document member of the same patent family

Date of the actual completion of the international search

29-10-2024

Date of mailing of the international search report

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INTERNATIONAL SEARCH REPORT
Information on patent family members

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